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10/574,633	11/13/2006	Jaques Scheuten	30882/40950	4131

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EXAMINER	
BERDICHEVSKY, MIRIAM	
ART UNIT	PAPER NUMBER
1723	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/574,633	SCHEUTEN ET AL.	
	Examiner	Art Unit	
	MIRIAM BERDICHEVSKY	1723	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *01 November 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-41* is/are pending in the application.

4a) Of the above claim(s) *21-40* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20 and 41* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Remarks

Claims 21-40 are withdrawn. Claims 1, 9-10, 12, 14, 17 and 19 are currently amended. Claims 1-20 and 41 are currently pending.

Status of Objections and Rejections

The objections from the previous office action are withdrawn in view of Applicant's amendments.

The rejections under 35 U.S.C. 112, second paragraph, from the previous office action are withdrawn in view of Applicant's amendments.

All other rejections are withdrawn in view of Applicant's amendment. New rejections are presented as necessitated by amendment.

Claim Objections

1. Claim 1 is objected to because of the following informalities: the amendment is not underlined as required. Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1-5 and 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata (EP 0940860), Gay (US 4638111), Probst (US 5626688) and Kim (*Effect of selenization pressure on $CuInSe_2$ thin films selenized using co-sputtered Cu-In precursors*).

As to claim 1, Nakata teaches a spherical shaped semiconductor for use in solar cells made by applying a conductive back onto a spherical substrate core ([0072], 22 on 21: figure 14) and forming an absorber layer from a precursor layer ([0072]: seed layer). Nakata teaches that CIS (copper, indium, selenide/sulfur) layers can be formed instead of silicon as the conversion layer of the spherical solar cell ([0076]) but is silent to the particulars for forming CIS solar cells.

Gay teaches detailed steps for making a CIS solar cell on a glass substrate (col. 8, lines 50-55) but is specifically silent to the use of soda-lime glass. Gay teaches that CIS is formed by depositing a layer of copper, depositing a layer of indium followed by reacting these precursor layers in the presence of a hydrogen compound of selenium (col. 9, lines 1-15). Probst teaches a conventional CIS solar cell comprising a soda lime glass substrate (col. 5, line 5), a Mo back contact layer (col. 5, lines 10-15). It would

have been obvious to one of ordinary skill in the art at the time of the invention to use the materials of Probst in making the spherical CIS solar cell with a soda lime glass substrate and a Mo contact layer because Probst teaches them as part of an improved CIS solar cell (col. 5, lines 1-5) especially since it has been held to be within the skill of a worker to select a known material based on its suitability for the intended use (MPEP 2144). Gay remains silent to specifically performing selenization at or below atmospheric pressure. Kim teaches that the pressure at which selenization is performed to form CIS layers is a result effective variable (figure 9). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the particulars of Gay to form the CIS spherical solar cell of Nakata because the methods of Gay achieve enhanced efficiency (Gay: col. 2, lines 55-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to use 1 atm because Kim teaches that resistivity is minimal using 1atm (figure 9) especially in light of the fact that as Gay does not teach a specific pressure one would assume standard pressure conditions (atomospheric). Moreover, it has been held to be within the skill of a worker in the art to optimize a result effective variable such as selenization pressure to achieve a desirable result, in this case minimize resistivity (MPEP 2144).

Regarding claim 2, modified Nakata teaches a Mo conductive layer (Gay: col. 8, lines 50-55). It also would have been obvious to use the metal layer of Gay in modified Nakata because Gay teaches Mo as the preferred material for the CIS absorber layer (col. 8, lines 50-55) especially since it has been held to be within the skill of a worker to select a known material based on its suitability for the intended use (MPEP 2144).

Regarding claim 3, modified Nakata does not teach the use of Ga (0%) which reads on the instant claim.

Regarding claim 4, modified Nakata teaches that the layers are deposited with PVD (Gay: col. 9, lines 5-10).

Regarding claim 5, modified Nakata teaches heating the precursor layers to 400°C prior to reacting the layer to form the CIS compound (Gay: col. 9, lines 10-15). The Examiner notes that the substrate will be heated to between 200 and 400°C, before the reaction takes place and thereby reads on the instant claimed invention.

Regarding claim 7, modified Nakata teaches depositing a buffer layer after forming the CIS layer (Gay: col. 9, lines 15-20).

Regarding claim 8, modified Nakata teaches depositing a high resistance ZnO layer and a low resistance ZnO layer after forming the CIS layer (Gay: col. 9, lines 15-45).

Regarding claim 9, modified Nakata teaches that the buffer layer is deposited by CVD (col. 9, lines 15-20).

5. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata and Probst as applied to claim 1 above and further in view of Menezes (US 20030230338).

Regarding claim 6, modified Nakata is silent to a KCN treatment after formation of the CIS layer. Menezes teaches that conventional p type CIS layers require a KCN etch ([0011]) to remove impurities. It would have been obvious to one of ordinary skill in

the art at the time of the invention to etch the p-type CIS cell of modified Nakata in KCN because Menezes teaches it is required in such cells ([0011]).

6. Claims 10-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata and Probst.

Regarding claims 10 and 20, Nakata teaches a spherical solar cell comprising an insulating substrate core coated with a back contact layer and a CIS compound semiconductor ([0011], [0076] and [0077]). Nakata is silent to the particulars of the spherical solar cell materials when the solar cell has a CIS absorber layer and is therefore silent to the insulating substrate being soda lime glass and the contact layer being Mo. Probst teaches a conventional CIS solar cell comprising a soda lime glass substrate (col. 5, line 5), a Mo back contact layer (col. 5, lines 10-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the materials of Probst in making the spherical CIS solar cell with a soda lime glass substrate and a Mo contact layer because Probst teaches them as part of an improved CIS solar cell (col. 5, lines 1-5) especially since it has been held to be within the skill of a worker to select a known material based on its suitability for the intended use (MPEP 2144).

Further regarding claim 20, claim 20 is a product claim such that the method steps are considered product by process and even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious

from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process (MPEP 2113).

Regarding claim 11, modified Nakata teaches that the core diameter is 2.5mm (Nakata: [0031]).

Regarding claim 12, modified Nakata teaches that the Mo layer is 1 micron thick (Probst: col.5, lines 10-15).

Regarding claim 13, modified Nakata teaches that the CIS layer is copper indium diselinide (Nakata: [0076] and Probst: col. 9, lines 5-10).

Regarding claim 14, modified Nakata teaches that the CIS layer is 2 microns thick (Probst: col. 8, lines 15-20).

Regarding claims 15-17, modified Nakata teaches a CdS buffer layer between 10 and 50nm formed above the CIS layer (col. 8, lines 25-30). In the case where the claimed ranges "overlap or lie inside ranges disclosed by the prior art" a prima facie case of obviousness exists (MPEP 2144).

7. Claims 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata and Probst as applied to claim 10 above and further in view of Gay.

Regarding claims 18-19, Probst teaches the use of a 1.5 micron layer of ZnO which can be used in combination with other layers but modified Nakata is specifically silent to a low and high resistance layer as well as their thicknesses.

Gay teaches a conventional CIS solar cell comprising high and low resistance ZnO layers on the CIS layer wherein the high resistance layer has a thickness between 70 and 200nm and the low resistance thickness is 1 micron (col. 9, lines 30-50). In the

case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists (MPEP 2144). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the multi resistance layer of Gay in modified Nakata because they provide high transmittance, as taught by Gay (col. 8, lines 30-40).

8. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nakata, Gay, Kim and Probst.

As to claim 41, Nakata teaches a spherical shaped semiconductor for use in solar cells made by applying a conductive back onto a spherical substrate core ([0072], 22 on 21: figure 14: seed layer) of smaller than 2.5 mm ([0031]) and forming an absorber layer from a precursor layer ([0072]). It has been held that where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (MPEP 2144). Nakata teaches that CIS (copper, indium, selenide/sulfur) layers can be formed instead of silicon as the conversion layer of the spherical solar cell ([0076]) but is silent to the particulars for forming CIS solar cells.

Gay teaches detailed steps for making a CIS solar cell. Gay teaches that CIS is formed by depositing a Mo layer on a glass substrate (col. 8, lines 50-55) then depositing a layer of copper, depositing a layer of indium followed by reacting these precursor layers in the presence of a hydrogen compound of selenium (col. 9, lines 1-

15). Gay remains silent to specifically performing selenization at or below atmospheric pressure. Kim teaches that the pressure at which selenization is performed to form CIS layers is a result effective variable (figure 9). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the particulars of Gay to form the CIS spherical solar cell of Nakata because the methods of Gay achieves enhanced efficiency (Gay: col. 2, lines 55-60). It would have been obvious to one of ordinary skill in the art at the time of the invention to use 1atm because Kim teaches that resistivity is minimal using 1atm (figure 9). Moreover, it has been held to be within the skill of a worker in the art to optimize a result effective variable such as selenization pressure to achieve a desirable result, in this case minimize resistivity (MPEP 2144).

Nakata and Gay remain silent to the glass substrate being soda lime glass. Probst teaches a conventional CIS solar cell comprising a soda lime glass substrate (col. 5, line 5), a Mo back contact layer (col. 5, lines 10-15). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the materials of Probst in making the spherical CIS solar cell with a soda lime glass substrate because Probst teaches them as part of an improved CIS solar cell (col. 5, lines 1-5) especially since it has been held to be within the skill of a worker to select a known material based on its suitability for the intended use (MPEP 2144).

Response to Arguments

Applicant's arguments filed 11/1/2010 have been fully considered but they are not persuasive. Applicant argues that Kim teaches away from use of a hydrogen compound of selenium in conjunction with at or below atmospheric pressure. The

Examiner respectfully disagrees. Kim is not relied upon as a teaching of the use of a hydrogen compound of selenium as the vapor source. Moreover, although Kim teaches that selenium pellets are used/preferred as the vapor source instead of a hydrogen selenium compound because H_2Se is toxic does not teach away from use of H_2Se. The prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed (MPEP 2121). Kim generally teaches that the pressure at which the selenium vapors crystallize effect the resultant CIS layer despite the vapor source. One would appreciate that selection of a known material source is within the skill of a worker in the art with expected results (potential toxic exposure/waste). Applicant argues that Probst teaches away from use of soda lime glass as the substrate. The Examiner respectfully disagrees. Probst's invention uses soda lime glass (col. 5, lines1-6). Probst teaches the use of a diffusion barrier to improve on the shortcomings of past solar cells made on glass. The instant claimed invention does not bar the use of the diffusion layer in conjunction with soda-lime glass. Applicant argues that Nakata is not open to use of glass substrates of Mo back contacts. The Examiner respectfully disagrees. Nakata teaches that various substrates can be used including fused silica (a type of glass) ([0077]). Nakata teaches that other materials can be used depending on the type of solar cell ([0076]). Molybdenum and soda-lime glass are well known materials for use in CIS solar cells as discussed above in relation to Gray and Probst.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **MIRIAM BERDICHEVSKY** whose telephone number is (571)270-5256. The examiner can normally be reached on M-Th, 10am-8pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/M. B./

Examiner, Art Unit 1723

/Alexa D. Neckel/
Supervisory Patent Examiner, Art Unit 1723